

The patient–physician relationship in patients with breast cancer: influence on changes in quality of life after rehabilitation

Erik Farin · Michaela Nagl

Accepted: 27 February 2012 / Published online: 16 March 2012
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Abstract

Purpose The objective of this study was to examine whether aspects of the patient–physician relationship for breast cancer patients have an influence on the change in health-related quality of life (HRQOL) after inpatient rehabilitation.

Methods $N = 329$ breast cancer patients undergoing inpatient rehabilitation in Germany were surveyed using questionnaires at the beginning of rehabilitation, end of rehabilitation, and 6 months after rehabilitation. Multiple imputations and multilevel models of change were used in the data analyses.

Results Even after comprehensive adjustment for socio-demographic, medical, psychological variables, and center effects, aspects of the physician–patient relationship were statistically and clinically relevant predictors of HRQOL after rehabilitation. Satisfaction with physician's care appears to have a rather short-term effect, but the effect of promoting patient participation can still be partially determined 6 months after rehabilitation. Other important predictors of HRQOL improvement are optimism, higher level of education, higher income, living with a partner, and the ability to work.

Conclusions By taking into consideration the patient's communication and participation needs, physicians can contribute to an improved HRQOL after rehabilitation. The high predictive power of socioeconomic factors shows that rehabilitation care can be more effective if it accounts for the specific situation of socially disadvantaged individuals.

Keywords Patient–physician relationship · Quality of life · Oncology · Optimism · Socioeconomic factors

Introduction

For cancer patients, the relationship between physician and patient is particularly significant, as the patients experience significant psychosocial distress due to the prognostic uncertainty and life-threatening character of the disease and thus need an empathic and supportive provider [1–3]. Venetis et al. [4] recently showed in a meta-analysis that for oncology patients, the physician's affective and instrumental communication behavior have a significantly positive association with patient satisfaction. An endpoint even more significant than patient satisfaction is health-related quality of life (HRQOL), which in addition to survival time is the most important goal in the treatment of cancer patients (e.g., [5, 6]).

According to de Haes and Bensing [7], the provider relationship can be viewed as intermediate endpoint and as mediator on the way to an improved HRQOL (as a long-term endpoint). Various studies showed that for cancer patients, aspects of the patient–physician relationship such as empathy [8], involvement in care and decision-making [9, 10], satisfaction with consultation and information [11], and overall patient satisfaction [12] are associated with a higher HRQOL.

The objective of this study was to examine whether aspects of the patient–physician relationship of breast cancer patients have an influence on the change in HRQOL after inpatient rehabilitation. The following hypotheses were examined: (1) aspects of the patient–physician relationship in rehabilitation have a statistically and clinically

E. Farin (✉) · M. Nagl
Department of Quality Management and Social Medicine,
University Freiburg - Medical Center, Engelbergerstr. 21,
79106 Freiburg, Germany
e-mail: erik.farin@uniklinik-freiburg.de

significant association with HRQOL change after rehabilitation, even after adjusting for several potential confounders, (2) the patient–physician relationship’s influence is greater in the short term (i.e., HRQOL change at the end of rehabilitation) than medium term (6 months after rehabilitation). It is assumed that this is because after leaving the rehabilitation center, the influence of the physician’s behavior at the center loses significance in the medium term in comparison with other factors (e.g., family, physician at place of residence).

According to existing findings in literature (e.g., [13–15]), age, living with a partner, education, employment, ability to work, and income are considered sociodemographic confounders. As medical variables (cf. e.g., [16–19]), the tumor stage (TNM staging system), the performance status (Karnofsky index), the length of the illness, and comorbidity are included in the analyses. To control the influence of important psychological variables, optimism and trait anger are also included (cf. e.g., [20–22]).

The primary goal of the study was to test the two hypotheses stated above. In addition, there was an exploratory study of the HRQOL changes that occur after oncological rehabilitation for breast cancer. In order to properly take the breadth of the construct of the patient–physician relationship into consideration, various aspects of interaction and communication were included that proved to be relevant in previous studies with cancer patients: promoting the patient’s involvement in care by the physician (e.g., [15, 23]), the patient’s active communication behavior (e.g., [24]), trust in the physician (e.g., [25]), the congruence between the physician’s treatment goals and the patient’s health valuations (cf. e.g., [26]), and overall satisfaction with the physician (e.g., [12]). Corresponding with the finding in literature that the significance of psychosocial predictors can vary greatly depending on the HRQOL aspect [27–29], different areas of HRQOL were measured and operationalized using various instruments.

Methods

Sample

The study was approved by the ethics committee of the University Freiburg (approval number 63/08). Women with breast cancer who were undergoing inpatient rehabilitation were surveyed. In Germany, inpatient oncological rehabilitation generally lasts 3 weeks and the goal is to prevent or mitigate impairment of participation in working life and in social life. According to the international classification of functioning, disability, and health ICF (e.g., [30]), goals are pursued on the somatic level (e.g., reducing pain), in

the functional area (e.g., encouraging activities of daily life), in the psychological area (e.g., reducing depression), but also at the social level (e.g., reintegration into working life) and in education (e.g., learning strategies for coping with anxiety). The treatment team is multidisciplinary and is headed by a physician. The patient generally has 4–5 therapy sessions a day on workdays. Rounds and consultations with the physician take place at least once a week, with additional consultations by appointment. Normally, there is a physician responsible for the patient who sees her frequently during the hospitalization period. Depending on the situation and extent of medical care required, the patient may have contact with other physicians.

The patient questionnaires were only given to patients who were able and willing to fill out the questionnaires (informed consent). $N = 530$ patients were asked to participate, $N = 329$ agreed. The percentage of patients who did not fill out the questionnaire (decliner) was 37.9 %. The most important reason for noninclusion was refusal to participate (67.2 %), followed by cognitive or physical limitations (8.0 %) and speech difficulties (5.5 %). For 19.4 % of the patients, no reason for noninclusion was reported. Due to inconsistent information (e.g., impossible differences in the ages given between measuring times), the data of $N = 17$ persons were removed from the data set, so $N = 312$ cases remained for the analysis. Table 1 provides information on the patients in the study.

Table 1 Respondent characteristics ($N = 312$)

Age (mean/SD)	55.2 (10.0)
Level of education (highest level completed)	
% elementary school	24.8
Employment	
% employed	59.8
Monthly household income (%)	
<500 Euro	1.2
500–1,000 Euro	11.0
1,000–1,500 Euro	11.0
1,500–2,000 Euro	14.2
2,000–2,500 Euro	16.5
2,500–3,000 Euro	13.4
3,000–3,500 Euro	11.0
>3,500 Euro	21.7
Karnofsky index (mean/SD)	84.3 (8.8)
Tumor stage (TNM) (%)	
Stage 0	4.2
Stage 1	32.1
Stage 2	31.7
Stage 3	7.6
Stage 4	4.5
Undefinable	19.9

The dropout rate was 5.8 % at the end of rehabilitation; it was 15.4 % 6 months after rehabilitation. We compared the dropout patients to the study patients in terms of all the respondent characteristics in Table 1 and discovered no differences having a p value $<.20$. In other words, the dropout patients did not differ from the study patients.

Instruments

At the beginning of rehabilitation, at the end of rehabilitation, and 6 months after rehabilitation, the patients were asked to fill out questionnaires that, in addition to sociodemographic information, included the Functional Assessment of Cancer Therapy [31] (FACT-B; scales: physical well-being PWB, social and family well-being SWB, emotional well-being EWB, functional well-being FWB, and breast cancer subscale BCS; range: PWB, SWB, FWB: 0–28; EWB: 0–24; BCS: 0–36, 0 = lowest HRQOL), the SF-12 [32] (scales: physical component PC and mental component MC; range: 0–100, 0 = lowest HRQOL), perceived involvement in care scales PICS [33] (scales: doctor facilitation DF, patient information PI; range: 1–4, 1 = least doctor facilitation/least patient information), trust in physician [34] (range: 0–100, higher scores = higher trust), and a self-developed scale for general patient satisfaction consisting of three items. (The physician was empathic and understanding. The physician explained everything concerning my symptoms in a way I understood. The physician arranged the proper therapies for me. Range: 1–5, 1 = lowest patient satisfaction.)

To measure the congruence between the physician's treatment goals and the patient's health valuations, the patient was requested to arrange nine possible improvements in health according to importance: feel clearly better physically PHYS; have clearly less pain PAIN; know everything important about the illness and its treatment KNOW; be able to engage in the desired social activities with family despite the illness FAM; do activities of daily life without pain ACTI; feel clearly better emotionally and psychologically EMO; be able to walk longer distances without pain MOB; succeed in exhibiting health-conscious behavior BEHAV; if employed—handle all activities at work despite the illness WORK. The aspect that is most important to the patient himself is ranked first, etc. Simultaneously, the physician was asked to rank the preceding areas with respect to their relevance as treatment goals. A discrepancy between patient and physician of maximum one rank was interpreted as agreement in that area; a discrepancy of more than one rank was considered nonagreement. To operationalize the psychological variables, the STAXI scale trait anger [35] and life orientation test LOT [36] were used.

The HRQOL instruments were used at every measuring point, and the confounders were measured at the beginning

of rehabilitation. We measured the patient–physician relationship variables once at the end of rehabilitation to enable a summarizing evaluation of that relationship covering the entire period of rehabilitation. The rehabilitation physicians filled out a documentation sheet at the beginning and end of rehabilitation. To measure comorbidity, a self-developed score (cf. [37]) was used.

The corresponding German language versions were used in this study. The reliability (Cronbach's α) of the German FACT ranges between .83 and .85 in our sample. The BCS-scale is, however, an exception, as it only achieved a Cronbach's α of .64. The SF-12 scales have Cronbach's α values of .70 (MC) and .78 (PC) [38], and the PICS scales .87 (DF) and .83 (PI) [39]. The German trust in physician scale is likewise reliable with its $\alpha = .90$ [40]. The reliability of the self-developed scale for general patient satisfaction equals .86. Most of the STAXI's published reliability values range between .75 and .90 [41]. Cronbach's α of LOT amounted to .73 in our sample.

Analyses

Multiple imputation

Since we conducted regression analyses with a large number of predictors, a method using casewise deletion would have many disadvantages (cf. [42]). Therefore, multiple imputation [43] was used. Five imputed data sets were created using NORM software [44] according to the recommendations of Rubin [43]. An expectation–maximization algorithm and the data augmentation procedure integrated in the NORM software were applied. The relevant parameters were combined according to the rules presented by Rubin [43].

Multilevel models for change

Analyses were conducted using multilevel models for change (growth curve modeling) to examine trajectories of HRQOL. This method addresses within-person and between-person variability simultaneously from a pair of submodels. The level 1 model describes how each person changes over time, while the level 2 models describe how these changes differ among people [45]. To answer the questions we had, we first developed a model describing just the short-term changes evident at the end of rehabilitation. The second step was testing a model that contained the trajectories of change up to 6 months after rehabilitation including all three measurement time points. We analyzed the fixed-effect predictors of the rate of change (slope) in the level-2 model. Our exploratory analyses lead us to posit a linear change trajectory for HRQOL change at the end of rehabilitation. Since the change trajectories change after

Table 2 Changes in quality of life after rehabilitation

	FACT: PWB	FACT: SWB	FACT: EWB	FACT: FWB	FACT: BCS	SF-12: PC	SF-12: MC
Start of rehabilitation t_0							
<i>N</i>	306	300	301	305	302	262	262
Mean	20.33	22.04	16.67	16.71	23.53	39.79	43.33
SD	4.98	5.24	4.71	5.67	5.38	9.77	11.80
End of rehabilitation t_1							
<i>N</i>	290	284	285	288	289	241	241
Mean	22.96	22.53	18.39	18.70	25.24	42.80	50.63
SD	4.47	5.17	4.12	5.38	5.37	9.04	10.32
Effect size t_0-t_1	.56	.09	.39	.36	.32	.32	.66
6 months after rehabilitation t_2							
<i>N</i>	262	257	252	260	257	226	226
Mean	22.64	21.89	18.24	19.57	25.67	45.19	48.27
SD	4.70	5.52	4.33	5.34	5.46	10.00	10.92
Effect size t_0-t_2	.48	-.03	.35	.52	.40	.55	.43

FACT scales: PWB physical well-being, SWB social/family well-being, EWB emotional well-being, FWB functional well-being, BCS breast cancer subscale

SF-12 scales: PC physical component, MC mental component

Range of FACT scales: PWB, SWB, FWB: 0–28; EWB: 0–24; BCS: 0–36, 0 = lowest HRQOL range of SF-12 scales: 0–100, 0 = lowest HRQOL

rehabilitation (see Table 2), we modeled discontinuous change. To assess our model in its entirety, we applied deviance statistics [46]. A significant deviance value indicates that the model employing the predictors reveals a better fit than the model without predictors (=unconditional growth model). Our analyses are oriented according to the recommendations made by Singer and Willett [46].

We adjusted for center effects in the first step. In the second block, all confounding sociodemographic variables that were listed in the introduction were added, in the third step medical variables, and in the fourth block, the psychological variables. Finally, in the fifth step, the characteristics of physician–patient relationship were included. A stepwise method of variable inclusion ($PIN = .05$) was employed. The predictors that were included in the model in at least two of the five imputed data sets were considered as potentially relevant predictors. With this restriction, more sparse models could be specified and problems of multicollinearity avoided. A separate model was specified for each of the seven dependent variables (two SF-12 scales, five FACT scales). Finally, the models that consisted only of potentially relevant predictors were again applied to all five imputed sets.

In order to estimate the clinical significance in addition to the statistical significance of the variables of the patient–physician relationship, for the models in which variables of the patient–physician relationship were included as significant predictors, we used the minimum and maximum values in the data set for these variables in the model

equation and calculated the resulting difference in the predicted HRQOL changes. This value was compared with existing values on minimally important differences (MID). Since as far as we know no MIDs have been published for cancer patients with the SF-12, the analysis is limited to the FACT scales. We are also unaware of any MIDs for the subscales regarding the FACT, so we refer to the results of the FACT sum scores. These consistently show (cf. [47, 48]) that a difference of about 5 % of the scale rank can be interpreted as a MID. The analyses to determine clinical significance were only carried out for those predictor variables that were shown to be statistically significant. Statistical analyses were done using HLM 6.06 [49] and PASW statistics 18.0.2 [50].

Effect sizes

Effect size was calculated by dividing the mean difference score by the pooled standard deviation of the pre- and post-treatment scores. As in Cohen [51], effect sizes of .20 were considered “small”, around .50 “medium”, and >.80 were deemed “large”.

Results

We first present descriptive results for the changes in HRQOL after rehabilitation and for characteristics of the patient–physician relationship. After this, the central

hypothesis addressing the predictive power of the patient–physician relationship variables is analyzed.

Changes in HRQOL after rehabilitation

Table 2 illustrates the positive small-to-medium changes in each scale at the end of rehabilitation. On the mental scale of SF-12, almost large effects can be described (.66), and on the FACT scale SWB only very small effects (.09). Even 6 months after rehabilitation, small-to-medium effects can still be registered. As comparison with the FACT reference values for the general German-speaking population shows (cf. [52]), patients' HRQOL is markedly lower at the beginning of rehabilitation—with the exception of the FACT scale SWB. After rehabilitation, the difference to the general population is approximately halved.

Describing the patient–physician relationship

Table 3 provides some information describing the patient–physician relationship of our study's breast cancer patients. While patient satisfaction is very high in terms of the scale (an average value of 4.66 with a maximum of 5), the other values are less positive, even when they often already lie in the higher positive range and are tending toward a good appraisal. There is congruence between physician's treatment goals and patient health valuations in 30–50 % of the patients.

Predictors of HRQOL change after rehabilitation

Tables 4 and 5 present the results of the multilevel models for change. Table 4 refers to the prediction of short-term change and Table 5 to change in HRQOL 6 months after rehabilitation. Some rehabilitation centers achieve obviously greater improvement in HRQOL than do other centers, particularly regarding short-term effects. The most important sociodemographic variables that positively affect improvements in HRQOL are the ability to work at admission, living with a partner, higher education, higher income, and being employed. Income is relevant only concerning short-term effects at the end of rehabilitation; other variables reveal some influence even 6 months after rehabilitation.

On a short-term basis, the burden caused by other diseases (as recorded in the comorbidity score) is the key medical predictor of HRQOL improvement. More numerous comorbidities are associated with lower effects. Moreover, a lower score on the Karnofsky index is also related in part to less improvement in HRQOL. The medical variables lose significance 6 months after rehabilitation.

Table 3 Description of patient–provider relationship in breast cancer patients ($N = 312$)

PICS: DF	
Mean (SD)	2.86 (.74)
PICS: PI	
Mean (SD)	3.02 (.74)
Trust in physician	
Mean (SD)	76.02 (13.77)
Patient satisfaction	
Mean (SD)	4.66 (.57)
Congruence	
PAIN	
% congruence	48.1 %
MOB	
% congruence	40.4 %
ACTI	
% congruence	45.3 %
EMO	
% congruence	45.6 %
KNOW	
% congruence	32.5 %
PHYS	
% congruence	41.8 %
BEHAV	
% congruence	35.2 %
FAM	
% congruence	38.0 %
WORK	
% congruence	31.1 %

PICS perceived involvement in care scales PICS (scales: DF doctor facilitation, PI patient information)

Congruence variables: PHYS feel clearly better physically, PAIN have clearly less pain, KNOW know everything important about the illness and its treatment, FAM be able to engage in the desired social activities with family despite the illness, ACTI do activities of daily life without pain, EMO feel clearly better emotionally and psychologically, MOB be able to walk longer distances without pain, BEHAV succeed in exhibiting health-conscious behavior, WORK if employed—handle all activities at work despite the illness

Range of PICS-DF and PICS-PI: 1–4, 1 = lowest doctor facilitation/lowest patient information

Range of trust in physician: 0–100, higher scores = higher trust

Range of patient satisfaction: 1–5, 1 = lowest patient satisfaction

Optimism at the start of rehabilitation is the single most important short- and long-term predictor of improvement in HRQOL: on nearly all the HRQOL scales, we observe a positive influence on the part of this psychological variable; however, it is not apparent in the SF-12's physical scale. Trait anger shows no relevance.

The variables of the patient–physician relationship reveal significant predictors short term in four HRQOL scales (FACT: SWB, EWB, FWB, SF-12: MC) and

Table 4 Predictors of HRQOL change (short-term change, at the end of rehabilitation)

	FACT: PWB	FACT: SWB	FACT: EWB	FACT: FWB	FACT: BCS	SF 12: PC	SF 12: MC
Rehab centers							
Center 1	–	–	–	–	–	4.409 (<i>p</i> = .004)	–
Center 3	–	1.450 (<i>p</i> = .014)	–	–	–	–	–
Center 6	–	–	1.595 (<i>p</i> = .005)	–1.375 (<i>p</i> = .048)	1.470 (<i>p</i> = .017)	2.649 (<i>p</i> = .021)	–
Sociodemographic variables							
Living with a partner	–	1.840 (<i>p</i> = .027)	–	–	–	–	–
Education: university–entrance diploma	–	–	–	–	–	3.906 (<i>p</i> < .001)	–
Employed	–	–	–	–	1.737 (<i>p</i> = .014)	–	–
Income	–	–	–	.409 (<i>p</i> = .022)	–	–	.806 (<i>p</i> = .005)
Inability to work (at admission)	–1.140 (<i>p</i> = .021)	–	–	–2.300 (<i>p</i> < .001)	–1.892 (<i>p</i> = .012)	–	–1.866 (<i>p</i> = .085)
Medical variables							
Karnofsky index	.101 (<i>p</i> = .001)	–	–	.0617 (<i>p</i> = .086)	–	.253 (<i>p</i> < .001)	–
Comorbidity score	–1.957 (<i>p</i> = .014)	–	–1.802 (<i>p</i> = .011)	–1.990 (<i>p</i> = .047)	–2.281 (<i>p</i> = .009)	–5.538 (<i>p</i> = .001)	–
TNM stage I	–	–	–	–	1.186 (<i>p</i> = .032)	–	–
Psychological variables							
LOT	.288 (<i>p</i> < .001)	.259 (<i>p</i> < .001)	.381 (<i>p</i> < .001)	.372 (<i>p</i> < .001)	.306 (<i>p</i> < .001)	–	.827 (<i>p</i> < .001)
STAXI	–	–2.65 (<i>p</i> < .001)	–1.183 (<i>p</i> < .001)	–	–1.178 (<i>p</i> = .004)	–	–.285 (<i>p</i> = .012)
Physician–patient relationship variables							
PICS: PI	–	–	–1.110 (<i>p</i> < .001)	–	–	–1.105 (<i>p</i> = .106)	–1.354 (<i>p</i> = .094)
PICS: DF	–	–	.983 (<i>p</i> = .002)	–	–	–	–
Patient satisfaction	–	1.669 (<i>p</i> = .001)	–	1.505 (<i>p</i> = .004)	–	–	2.482 (<i>p</i> = .019)
Congruence: KNOW	.857 (<i>p</i> = .059)	–	–	–	–	–	–
Congruence: BEHAV	–	–	–	–	–	–	2.764 (<i>p</i> = .011)
Deviance statistic							
Deviance	3,615.64	3,733.21	3,490.76	3,764.17	3,772.35	4,466.36	4,646.74
Comparison with unconditional growth model (differences, <i>df</i>) ¹	69.76 (5)***	69.52 (5)***	111.64 (8)***	113.60 (8)***	70.57 (7)***	71.48 (7)***	93.66 (9)***

FACT scales: PWB physical well-being, SWB social/family well-being, EWB emotional well-being, FWB functional well-being, BCS breast cancer subscale
 SF-12 scales: PC physical component, MC mental component
 LOT life orientation test, STAXI scale trait anger, PICS perceived involvement in care scales PICS (scales: DF doctor facilitation, PI patient information)
 Congruence variables: KNOW know everything important about the illness and its treatment, BEHAV succeed in exhibiting health-conscious behavior
 Fixed-effect coefficients of the rate of change (slope) in the level-2 model (– not in the model). Significant coefficients (*p* < .05) are printed in bold type
 1 *** *p* < .001; ** *p* < .01; * *p* < .05

Table 5 Predictors of HRQOL change (medium-term change, 6 months after rehabilitation)

	FACT: PWB	FACT: SWB	FACT: EWB	FACT: FWB	FACT: BCS	SF 12: PC	SF 12: MC
Rehab centers							
Center 4	–	–	–	.771 ($p = .078$)	–	–	–
Center 6	–	–	–	.297 ($p = .294$)	–	1.325 (.015)	–
Sociodemographic variables							
Age	–	–	–	–	–	–	–
Living with a partner	–	.641 ($p = .012$)	–	–	–	1.368 ($p = .018$)	–
Education: elementary school	–	–	–	–	–	–	–
Education: university–entrance diploma	–	–	.567 ($p = .024$)	.518 ($p = .051$)	–	–	1.201 (.066)
Employed	–	.502 ($p = .015$)	–	–	–	–	–
Income	–	–	–	–	–	–	–
Inability to work (at admission)	–	–.436 ($p = .040$)	–	–	–	–	–
Medical variables							
Karnofsky index	–	–	–	–	–	.070 ($p = .017$)	–
TNM stage 4	–	–	1.031 ($p = .031$)	–	–	–	–
Psychological variables							
LOT	.085 ($p = .002$)	.051 ($p = .113$)	.088 ($p < .001$)	.099 ($p = .001$)	.083 ($p = .022$)	.108 ($p = .118$)	.231 (.007)
STAXI	–	–	–	–	.040 ($p = .129$)	–	–
Physician–patient relationship variables							
PICS: DF	.380 ($p = .009$)	–	.284 ($p = .117$)	–	–	–	–
Trust in physician	–	–	–	–	–	–	–
Patient satisfaction	–	–	–	–	–	–	–
Congruence: PAIN	–	–	–	–	–	–	–
Congruence: EMO	–	–	–	–	–	–	1.048 (.076)
Congruence: ACTIV	.417 ($p = .050$)	–	.301 ($p = .145$)	–	.468 ($p = .079$)	–	.888 ($p = .091$)
Deviance statistics	–	–	–	–	–	–	–
Deviance	5,032.00	5,024.06	4,830.14	5,225.34	5,208.25	6,456.79	6,749.53
Comparison with unconditional growth model (differences, df) ¹	43.39 (5)***	24.12 (4)***	46.48 (7)***	35.59 (5)***	24.72 (4)***	27.90 (4)***	41.67 (6)***

FACT scales: PWB physical well-being, SWB social/family well-being, EWB emotional well-being, FWB functional well-being, BCS breast cancer subscale

SF-12 scales: PC physical component, MC mental component

LOT life orientation test, STAXI scale trait anger, PICS perceived involvement in care scales (PICS: DF doctor facilitation, PI patient information)

Congruence variables: PAIN have clearly less pain, ACTIV do activities of daily life without pain, EMO feel clearly better emotionally and psychologically

Fixed-effect coefficients of the rate of change (slope) in the level-2 model (– not in the model). Significant coefficients ($p < .05$) are printed in bold type

¹ *** $p < .001$; ** $p < .01$; * $p < .05$

midterm in one HRQOL scale (FACT: PWB). Our analyses of the clinical significance of HRQOL changes predicted by the models lead us to conclude that the patient–physician relationship variables that exert a statistically significant short-term effect in all cases also demonstrate a clinically relevant influence. An exception to this is the “congruence: BEHAV” variable in the SF-12 MC. In the medium term, only the “PICS Doctor Facilitation” patient–physician relationship variable proved to be statistically significant. This variable is not associated with a clinically relevant change in HRQOL, as it (at 4.1 %) fails to attain the necessary MID (5 % of the scale’s range).

In the short term, general patient satisfaction is the most important predictor in the block of the patient–physician relationship. Patients who perceive their physician as empathic, have been given information they understand, and have the impression that the physician has given them the proper instructions have higher HRQOL increases immediately after rehabilitation. In the medium term, perceived involvement in care is the most significant variable of the physician–patient relationship. However, its influence is only apparent in the FACT scale physical well-being. As the deviance statistics show, all these models reveal a better fit than the models without predictors.

Discussion

Changes in HRQOL after oncological rehabilitation

We observed small-to-medium positive changes in HRQOL after rehabilitation. Since we had no control group, this finding provides no proof of the rehabilitation program’s efficacy. Those studies that have examined trajectories of psychological distress and HRQOL of breast cancer patients after surgery (i.e., [53, 54]) concluded that health outcomes improved in certain subgroups independent of rehabilitation care. It would thus be worthwhile to differentiate various subgroups of respondents (e.g., [55, 56]) when conducting a more precise analysis of trajectories of HRQOL.

The patient–physician relationship for patients with breast cancer

Although the trust in the physician is quite high, the values are somewhat lower than those found by Arora et al. [57], for example, who also studied breast cancer patients. Patient activation by the physician is moderately high; it is estimated to be somewhat more pronounced than in a German sample of surgical and internal medicine patients (cf. [58]). The general patient satisfaction is very positive, which is not surprising, as in many studies—also for breast

cancer patients (cf. [59, 60])—a high level of satisfaction up to ceiling effects was shown. The variables of the agreement between the patient’s health valuations and the physician’s treatment goals are much more discriminating.

Predictors of HRQOL change after oncological rehabilitation

Among the sociodemographic variables, the significance of living with a partner and of being employed is particularly obvious. This can be interpreted as revealing the importance of the social support network to improvement in the HRQOL. This correlation has been demonstrated repeatedly (z.B. [61, 62]). Family members are the most important source of social support, particularly for cancer patients, as shown by Julkunen et al. [21]. Another important predictor is education—a lower level of education is a risk factor for less improvement in HRQOL after rehabilitation. This finding was also made in other studies with cancer patients (e.g., [17, 63, 64]), although it is unclear how this influence functions. Knight et al. [63] discuss two possible explanations—patients with less education (a) may experience greater difficulty understanding instructions in educational material and (b) may have lives that are more adversely affected by cancer. In our study’s case, (b) is less plausible, as we study the HRQOL improvements in a uniform setting for all patients and income was adjusted. We, therefore, assume that the phenomenon is primarily attributable to the fact that patients with less education are less able to follow educative interventions and to benefit from them.

As in [63], in our study, income also had an influence independent of education level; persons with lower incomes experienced less improvement in the HRQOL in the functional and mental area immediately after rehabilitation. This dependency of the HRQOL on socioeconomic status is not unusual (cf. [14, 65, 66]), but since in our study the phenomenon did not occur 6 months after rehabilitation, it is not easy to explain. It is conceivable that individuals of lower socioeconomic status find hospitalization more burdensome than those of higher socioeconomic status, as the financially less well-off often have greater difficulty managing financial, family, and job-related issues (i.e., childcare) during their absence. Because of this greater stress, the persons may benefit less from rehabilitation, which leads to less improvement of the HRQOL.

Age was only relevant in the FACT scale addressing physical well-being. This finding was confirmed by Härtl et al. [28], who also reported that higher age is predictive of poorer physical functioning but not of other aspects of HRQOL. Our data do not verify the finding of another study, namely that the mental HRQOL changes in younger

patients are more negative (i.e., [67]). Older patients seem to reveal specific patient–physician interaction needs (i.e., [12, 68]), but only in certain categories, is age associated with trajectories of HRQOL after rehabilitation.

Medical variables are sometimes relevant, but the significance of the coefficients is not as apparent as other variables. This may be surprising in view of the significance of physical condition for general well-being. But several other investigators also observed this outcome (e.g., [13, 27, 28]). Short and Mallonee [69] explain this in that the subjective conceptualization of cancer is more important for HRQOL than objective indicators of an illness's severity. This applies in particular to those with a long history of illness.

Of the personality variables, trait anger—in contrast to [21, 70]—proved not to be relevant. But optimistic patients demonstrate higher HRQOL changes. Overall, optimism was the single most important predictor for an improvement in HRQOL after rehabilitation. There have been few studies thus far demonstrating this outcome (especially in breast cancer patients) involving a comprehensive adjustment for sociodemographic and medical variables.

The central hypotheses of our study address the variables of the physician–patient relationship. Both hypotheses stated in the introduction can be considered confirmed. In the short term, general patient satisfaction is a statistically and clinically significant predictor in three of the seven HRQOL scales observed. It is surprising that this variable in particular, which does not discriminate well due to high general satisfaction, is especially significant. This can presumably be explained by the highly relevant contents in the items on this scale. Our scale essentially measures satisfaction with information received and empathy. There are empirical studies for both constructs that verify the relevance of these communication aspects to cancer patients (e.g., [8, 11, 17]).

As predicted, the significance of the variables for the physician–patient relationship is reduced 6 months after rehabilitation. At this time, the only relevant influencing factor is the physician's support of patient involvement. The studies [9, 10, 53, 71] also find positive consequences of a participative physician–patient relationship with breast cancer patients. It is interesting that patient participation is the sole variable to reveal a medium-term influence as well. One can assume that emotional and informational support from the physician is important in the short term, but that this aspect of the relationship becomes less significant in daily life after rehabilitation. For a medium-term positive development of HRQOL, it appears to be important that the physician actively involves the patient in treatment, for example, to improve self-management competencies in daily life and internal control orientation. As a limitation, it should be mentioned that the relevance of the respective

PICS scale applies only to physical well-being. The influence of patient participation might have been more pronounced had we not considered patient participation as such, but rather the corresponding congruence between the patient's preferences and the physician's behavior (as in [9]).

Regardless of the statistical and clinical significance proven here, the question can be posed whether proof by using just several of a total of seven HRQOL scales actually justifies the statement that the physician–patient relationship is relevant. We must take into consideration that by including the variables of the patient–physician relationship in the last step, we have undertaken a strict test and have most probably determined a lower limit for the relevance of the physician–patient relationship. All influences of the physician–patient relationship that are mediated or moderated via previously adjusted predictors (e.g., if the patient–physician communication is more effective in better educated patients, cf. [72]) are not attributed to the physician–patient relationship. In our analyses, only the direct effects of the physician–patient relationship on HRQOL were measured. We, therefore, think that even in view of the limited evidence, the relevance of the physician–patient relationship to HRQOL can be considered a significant result.

Limitations

Our study has several limitations, the most important of which are discussed below. One important limitation is due to the fact that we used only self-report measures. We cannot refute the criticism that an underlying response style (common method variance) might have led to our results. It would have been better to measure facets of the physician–patient relationship using observation methods as well. Furthermore, we adjusted for several confounders, but not for depression or general psychological distress, which was shown to be relevant in a number of studies (e.g., [73]). We could use the argument that Paika et al. [74] showed in a current study that personality variables and psychological distress are associated with the HRQOL independently of each other. The influence of optimism we demonstrated would presumably also have been verifiable if psychological distress were adjusted. As we had no data available on our patients' therapy prior to rehabilitation (i.e., chemotherapy) or on individual therapies during rehabilitation, these potential confounders could not be considered.

In our statistical analyses, we have not considered the multilevel structure of data that result because several patients were assigned to one physician. This was not possible, as information on the assignment was not available to us. In order to limit the complexity of the analysis, we did not examine the effect pathways between the

variables of the patient–physician relationship (e.g., the causal pathway between patient participation and patient satisfaction, cf. [4]) or the causal pathways between the patient–physician relationship and HRQOL in more detail. In our opinion, a significant advance could be anticipated from future studies that use analytic approaches such as structural equation modeling (cf. e.g., [75]).

The generalizability of our findings must be assessed with caution, as we studied only breast cancer patients who underwent inpatient rehabilitation in Germany. Furthermore, we had a fairly high nonresponder rate. And finally, no adjustments for multiple testing were made, and the results, therefore, need to be interpreted with caution. It would be desirable to replicate the findings in another sample.

Acknowledgments The project from which the data reported here stem (“Patient-oriented outcome measurement: health valuation and assessment of the relevance of the changes in patients’ participation”) was supported by the German Federal Ministry for Education and Research as part of the funding program “Chronic Illnesses and Patient Orientation”. We thank the participating rehabilitation centers and their staff: Rheingau-Taunus-Klinik (Bad Schwalbach), Median-Klinikum für Rehabilitation (Bad Salzungen), Reha-Zentrum Todtmoos, Klinik Wehrawald (Todtmoos), Paracelsus Klinik (Scheidegg), Klinik Graal-Mürizt (Ostseeheilbad Graal-Mürizt), Habichtswald-Klinik (Kassel-Wilhelmshöhe), Rosentrittklinik (Bad Rappenau).

Conflict of interest The authors declare that they have no competing interests.

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